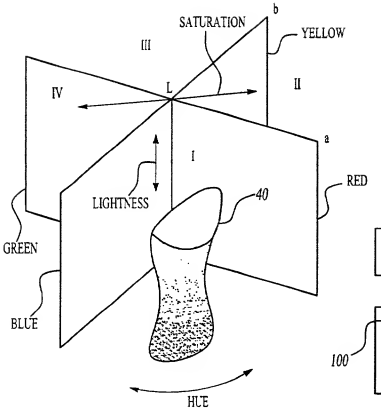
SATURATION
b
YELLOW
III
IV
L
II
a
I
LIGHTNESS
40
RED
GREEN
BLUE
HUE

Fig-1

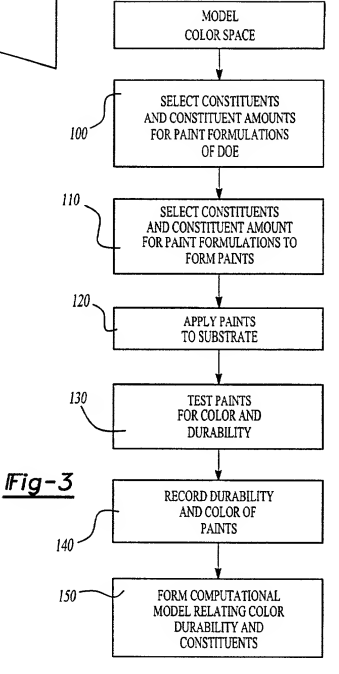
MODEL COLOR SPACE
100
SELECT CONSTITUENTS AND CONSTITUENT AMOUNTS FOR PAINT FORMULATIONS OF DOE
110
SELECT CONSTITUENTS AND CONSTITUENT AMOUNT FOR PAINT FORMULATIONS TO FORM PAINTS
120
APPLY PAINTS TO SUBSTRATE
130
TEST PAINTS FOR COLOR AND DURABILITY
140
RECORD DURABILITY AND COLOR OF PAINTS
150
FORM COMPUTATIONAL MODEL RELATING COLOR DURABILITY AND CONSTITUENTS

Fig-3

DESIGN FACTORS:

FACTORS	FUNCTION	LEVELS
PERYLENE	BACKBONE OF SPACE	5 - 60%
QUINDACRIDONE	BLUE TINT	0 - 40%
RUSSET MICA	PEARL AND BLUE	0 - 50%
ALUMINUM	LIGHTNESS/DARKNESS & HIDING	5% (CONSTANT)
BLACK	LIGHTNESS / DARKNESS & HIDING	0.5% (CONSTANT)
TRANS RED OXIDE	LIGHTNESS / DARKNESS	2% (CONSTANT)

CHART A

DESIGN LEVELS:

	FACTORS					
RUN	PERYLENE	BLUE RUSSET MICA	QUINACRIDONE	RED IRON OXIDE	BLACK	ALUMINUM
1	60.00	32.00	0.00	2.50	0.50	5.00
2	60.00	0.00	32.00	2.50	0.50	5.00
3	5.00	50.00	37.00	2.50	0.50	5.00
4	42.00	50.00	0.00	2.50	0.50	5.00
5	52.00	0.00	40.00	2.50	0.50	5.00
6	5.00	47.00	40.00	2.50	0.50	5.00
7	37.33	29.83	24.83	2.50	0.50	5.00
8	56.00	0.00	36.00	2.50	0.50	5.00
9	51.00	41.00	0.00	2.50	0.50	5.00
10	5.00	48.50	38.50	2.50	0.50	5.00
11	60.00	16.00	16.00	2.50	0.50	5.00
12	23.50	50.00	18.50	2.50	0.50	5.00
13	28.50	23.50	40.00	2.50	0.50	5.00
14	48.67	30.92	12.42	2.50	0.50	5.00
15	48.67	14.92	28.42	2.50	0.50	5.00
16	21.17	39.92	30.92	2.50	0.50	5.00
17	39.67	39.92	12.42	2.50	0.50	5.00
18	44.67	14.92	32.42	2.50	0.50	5.00
19	21.17	38.42	32.42	2.50	0.50	5.00

CHART B

Fig-2

SAMPLE	CONSTITUENTS					COLOR COORDINATES									DURABILITY CHARACTERISTICS			
						75°			45°			25°			ADHESION	GLOSS	FADE	DOI
#	C_1	C_2	C_3		C_n	L^*	a^*	b^*	L^*	a^*	b^*	L^*	a^*	b^*				
S_1				...														
S_2																		
S_3																		
S_4				...														
⋮															⋮			
S_X																		

Fig–5

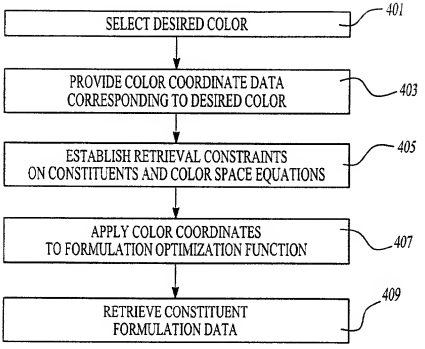
SELECT DESIRED COLOR
401
PROVIDE COLOR COORDINATE DATA CORRESPONDING TO DESIRED COLOR
403
ESTABLISH RETRIEVAL CONSTRAINTS ON CONSTITUENTS AND COLOR SPACE EQUATIONS
405
APPLY COLOR COORDINATES TO FORMULATION OPTIMIZATION FUNCTION
407
RETRIEVE CONSTITUENT FORMULATION DATA
409

Fig-4

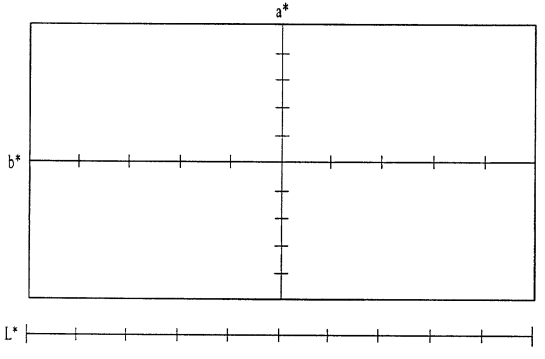
a*
b*
L*

Fig-6

	A	B	C	D	E	F	G	H	I	J	K	L
1				PIG 1	PIG 2	PIG 3	PIG 4	PIG 5				
2		FORMULATION DATA		$C1_{25}$	$C2_{25}$	$C3_{25}$	$C4_{25}$	$C5_{25}$				
3		FORMULATION DATA		$C1_{45}$	$C2_{45}$	$C3_{45}$	$C4_{45}$	$C5_{45}$				
4		FORMULATION DATA		$C1_{75}$	$C2_{75}$	$C3_{75}$	$C4_{75}$	$C5_{75}$				
5												
6		UPPER PI:P CONSTRAINT		$(p_1:P)_u$	$(p_2:P)_u$	$(p_3:P)_u$	$(p_4:P)_u$	$(p_5:P)_u$				
7		LOWER PI:P CONSTRAINT		$(p_1:P)_l$	$(p_2:P)_l$	$(p_3:P)_l$	$(p_4:P)_l$	$(p_5:P)_l$				
8										$L^*a^*b^*$ CONSTRAINTS	C/S MODEL EQUATIONS	
9			K	k1	k2	k3	k4	k5				
10		L^*	K_{L25}	$k1_{L25}$	$k2_{L25}$	$k3_{L25}$	$k4_{L25}$	$k5_{L25}$			L^*_{25}	<=SOLVER TARGET
11	25	a^*	K_{a25}	$k1_{a25}$	$k2_{a25}$	$k3_{a25}$	$k4_{a25}$	$k5_{a25}$		DESIRED a^*_{25}	a^*_{25}	
12		b^*	K_{b75}	$k1_{b25}$	$k2_{b25}$	$k3_{b25}$	$k4_{b25}$	$k5_{b25}$		DESIRED b^*_{25}	b^*_{25}	
13		L^*	K_{L45}	$k1_{L45}$	$k2_{L45}$	$k3_{L45}$	$k4_{L45}$	$k5_{L45}$		DESIRED L^*_{25}	L^*_{25}	
14	45	a^*	K_{a45}	$k1_{a45}$	$k2_{a45}$	$k3_{a45}$	$k4_{a45}$	$k5_{a45}$		DESIRED a^*_{25}	a^*_{25}	
15		b^*	K_{b75}	$k1_{b45}$	$k2_{b45}$	$k3_{b45}$	$k4_{b45}$	$k5_{b45}$		DESIRED b^*_{25}	b^*_{25}	
16		L^*	K_{L75}	$k1_{L75}$	$k2_{L75}$	$k3_{L75}$	$k4_{L75}$	$k5_{L75}$		DESIRED L^*_{25}	L^*_{25}	
17	75	a^*	K_{a75}	$k1_{a75}$	$k2_{a75}$	$k3_{a75}$	$k4_{a75}$	$k5_{a75}$		DESIRED a^*_{25}	a^*_{25}	
18		b^*	K_{b75}	$k1_{b75}$	$k2_{b75}$	$k3_{b75}$	$k4_{b75}$	$k5_{b75}$		DESIRED b^*_{25}	b^*_{25}	

Fig-7

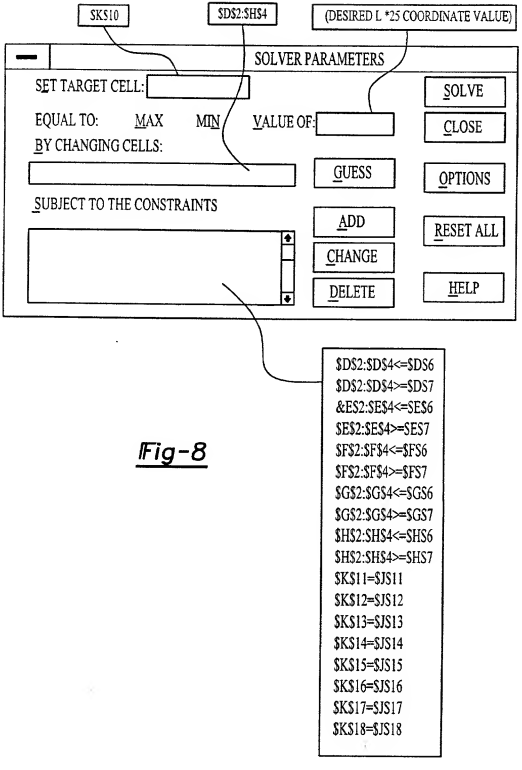
$K$10
$D$2:$H$4
(DESIRED L *25 COORDINATE VALUE)
SOLVER PARAMETERS
SET TARGET CELL:
EQUAL TO: MAX MIN VALUE OF:
BY CHANGING CELLS:
SUBJECT TO THE CONSTRAINTS
SOLVE
CLOSE
GUESS
OPTIONS
ADD
RESET ALL
CHANGE
DELETE
HELP
$D$2:$D$4<=$D$6
$D$2:$D$4>=$D$7
&E$2:$E$4<=$E$6
$E$2:$E$4>=$E$7
$F$2:$F$4<=$F$6
$F$2:$F$4>=$F$7
$G$2:$G$4<=$G$6
$G$2:$G$4>=$G$7
$H$2:$H$4<=$H$6
$H$2:$H$4>=$H$7
$K$11=$J$11
$K$12=$J$12
$K$13=$J$13
$K$14=$J$14
$K$15=$J$15
$K$16=$J$16
$K$17=$J$17
$K$18=$J$18

Fig-8

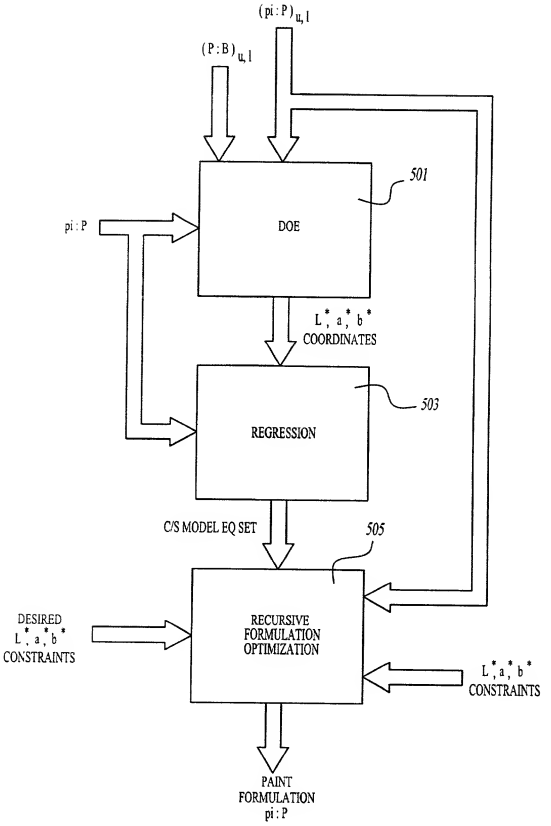

Fig-9